



# IMPUTING HOUSEHOLD CHARACTERISTICS IN THE REGISTER BASED SURVEY OF THE SWISS POPULATION CENSUS

UNECE Work Session on Statistical Data Editing,  
WP.5, Ljubljana 9 May 2011

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# Introduction



# Swiss population Census 2010

- ▶ First time register based Swiss population Census.
- ▶ Census =
  - ▶ municipalities' registers (RS)
  - ▶ federal housing and dwelling register (FHDR)
  - ▶ structural sample survey
  - ▶ two annual sample surveys on specific themes.
- ▶ RS contains
  - ▶ demographic variables,
  - ▶ link to housings of FHDR,
  - ▶ household identifier.



## Register based survey

- ▶ Household identifier per person:
  - ▶ dwelling identification number (DIN) of FHDR, 80%, **or**
  - ▶ municipality HHID, 15%.
- ▶ Heterogeneous quality depending on municipality, i.e. available DIN per municipality  $\in [5\%; 100\%]$ .
- ▶ Aim: produce basic household statistics
  1. number of household members,
  2. household typology.

→ published on municipality level  $\Rightarrow$  5% missings have to be treated.



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# Treatment strategies



# Treatment strategies

## Imputing household characteristics

1. to the person: consistency w.r.t. person + household + housing + dwelling level  $\Rightarrow$  ideal solution, but abandoned because too complex.
2. i.e. link between households with HHID only and dwellings: basic HH-statistics available  $\Rightarrow$  of minor interest at present.
3. to the dwelling  $\rightarrow$  no person/household relations to be considered  $\Rightarrow$  investigated in detail.



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# Imputing HH-characteristics to the dwellings

Swiss Statistics





## Preconditions

- ▶ People - housings link available and reliable for whole population.
- ▶ Reliable links between people and dwellings (DIN).
- ▶ FHDR is complete and number of rooms available for each dwelling + reflects reality.
- ▶ Enough people with DIN are available for estimating distributions.



## Imputation procedure

Splitting up the imputation procedure into two main steps:

1. impute number of inhabitants per dwelling,
2. impute household typology given the number of inhabitants per dwelling.
  - ▶ reduces complexity
  - ▶ 1st main step meets 1st HH-characteristics publication level.



# 1. Imputing number of inhabitants per dwelling

- ▶ Allocation problem of  $n$  people to  $m$  dwellings → repeated SRSWR used for generation.
- ▶ Distribution from housings with people all having a DIN: derive selection probability of allocations per housing.
- ▶ Preliminary results from simulation study: differences imputed vs. original relative frequencies of number of inhabitants by number of rooms by municipality → mostly  $\in [-0.5\%; 0.5\%]$  with extremes  $\in [-2\%; 2\%]$ .
- ▶ Alternative methods under consideration: calibration of the distribution and CUBE method.



## 2. Imputing household typology given the number of inhabitants

1. Repeat several times generation of dwelling links of  $n$  people to  $m$  dwellings such that condition on number of inhabitants is met.
2. Calculate household typology for links.
3. Distribution of housings with people all having a DIN: derive selection probability.

Imputation procedure is presently implemented.



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# Conclusions



## Conclusions

- ▶ Imputation of household characteristics to
  - ▶ people → ideal but too complex,
  - ▶ dwellings → reduced complexity, further complexity reduction by splitting up the procedure.
- ▶ *Imputing link between households with HHID only and dwellings: of minor interest at present.*
- ▶ Imputing number of inhabitants: first preliminary results encouraging.



## Future work

- ▶ Imputing household typology: finish implementation.
- ▶ Further investigate application of calibration and the CUBE method.
- ▶ Sensitivity analysis with respect to different parameters.
- ▶ Take into account special configurations and partially formed households.



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